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GB 2013502A
GB 1566211
GB 1556364
GB 1486865
GB 1469425
GB 1465636
GB 1328111
GB 1299449
GB 992843
WO 79/00042A
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(54) Physiological electric signals monitoring electrode

(57) An electrode assembly comprises a pad 1 of foamed electrically insulating material with adhesive on its lower surface 2 for adhering the assembly to a patient, and at least one electrode (three are shown in Fig. 2) passing through the pad. Each electrode may comprise a rigid plastics cup 8 secured in a socket 7 in the pad 1 by flanges 5, 6, flange 6 being adhered to foamed material 9 saturated with electrically conducting paste. Individual electrode pads may be connected to an ECG by respective cables 13 (Fig. 6), or alternatively an ECG may be mounted on the rear surface of a pad 1 having three electrodes by engaging male press-studs 4 of the electrodes in sockets 10 in the ECG 12 (Figs. 4, 5).

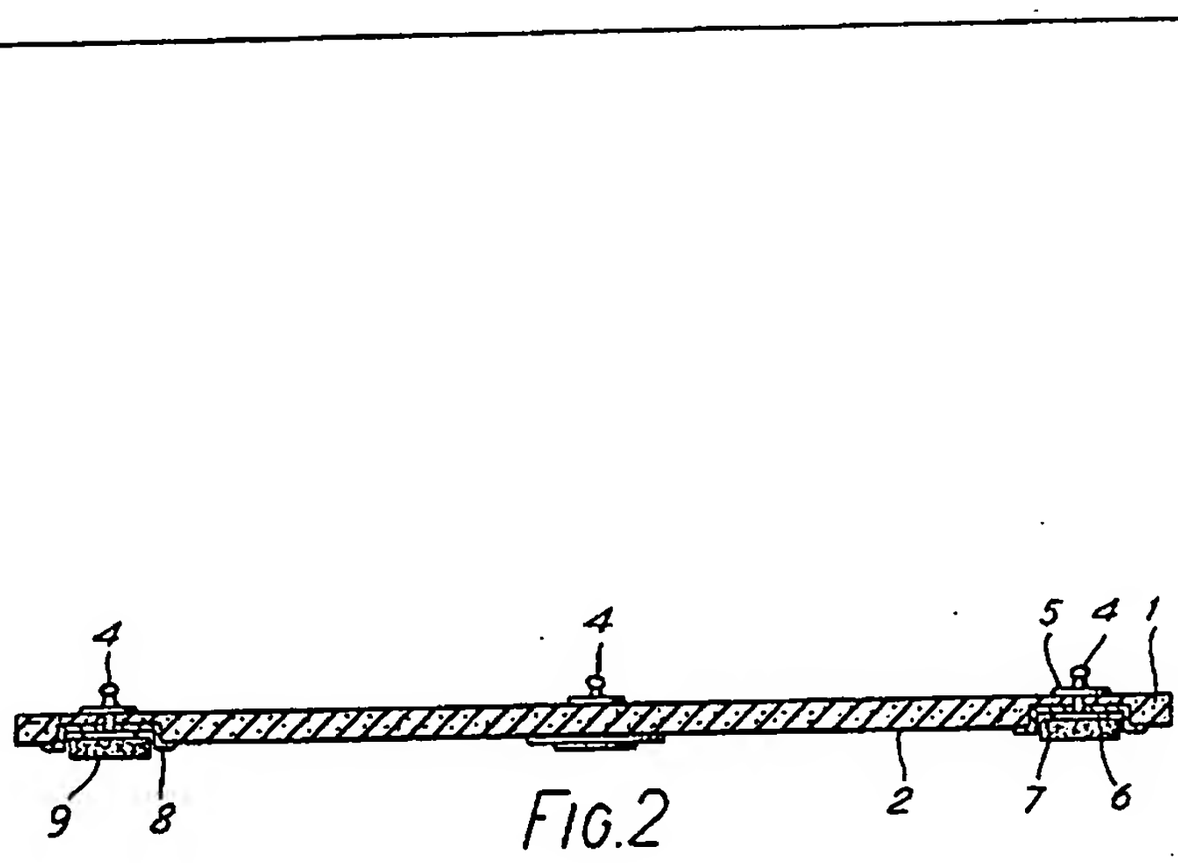

FIG.2

GB 2 070 438A

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

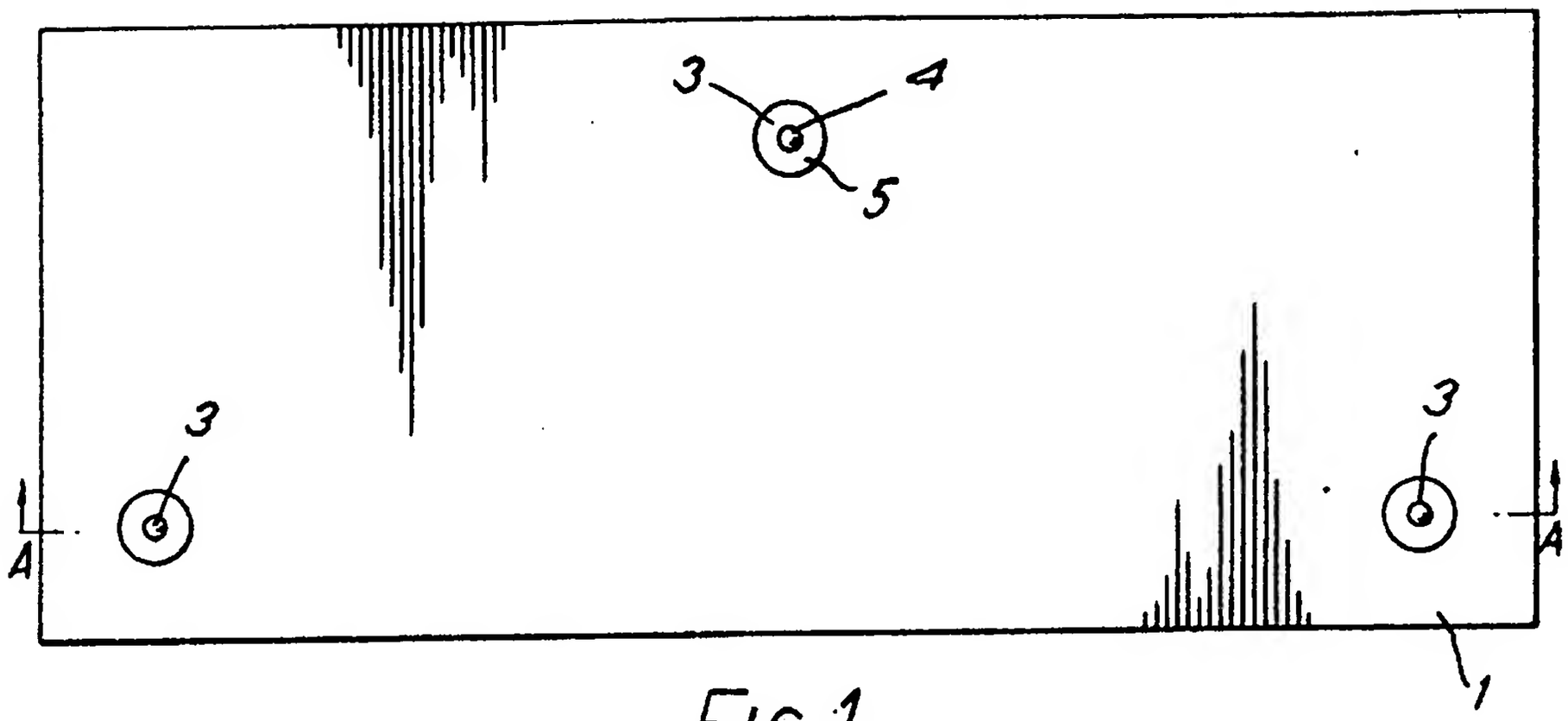

FIG.1

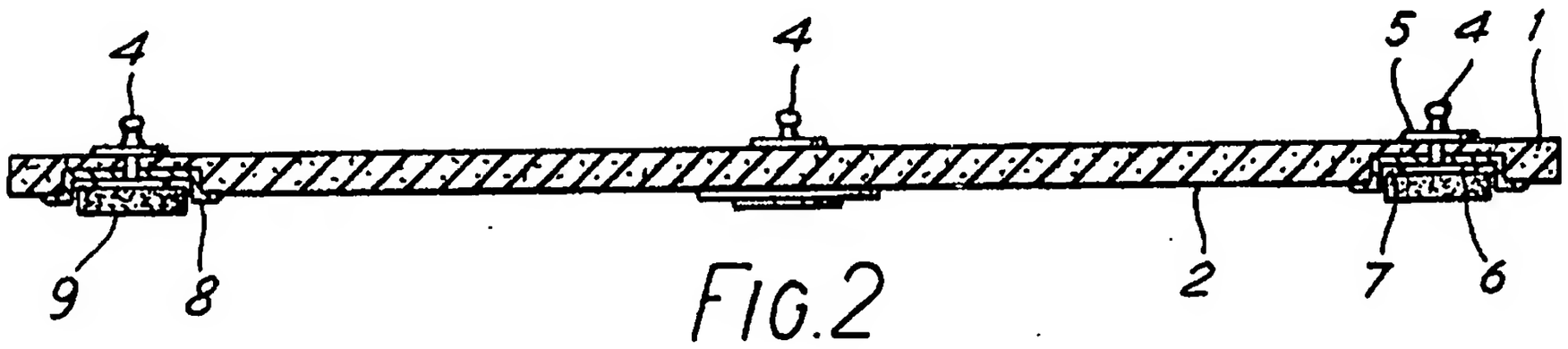

FIG.2

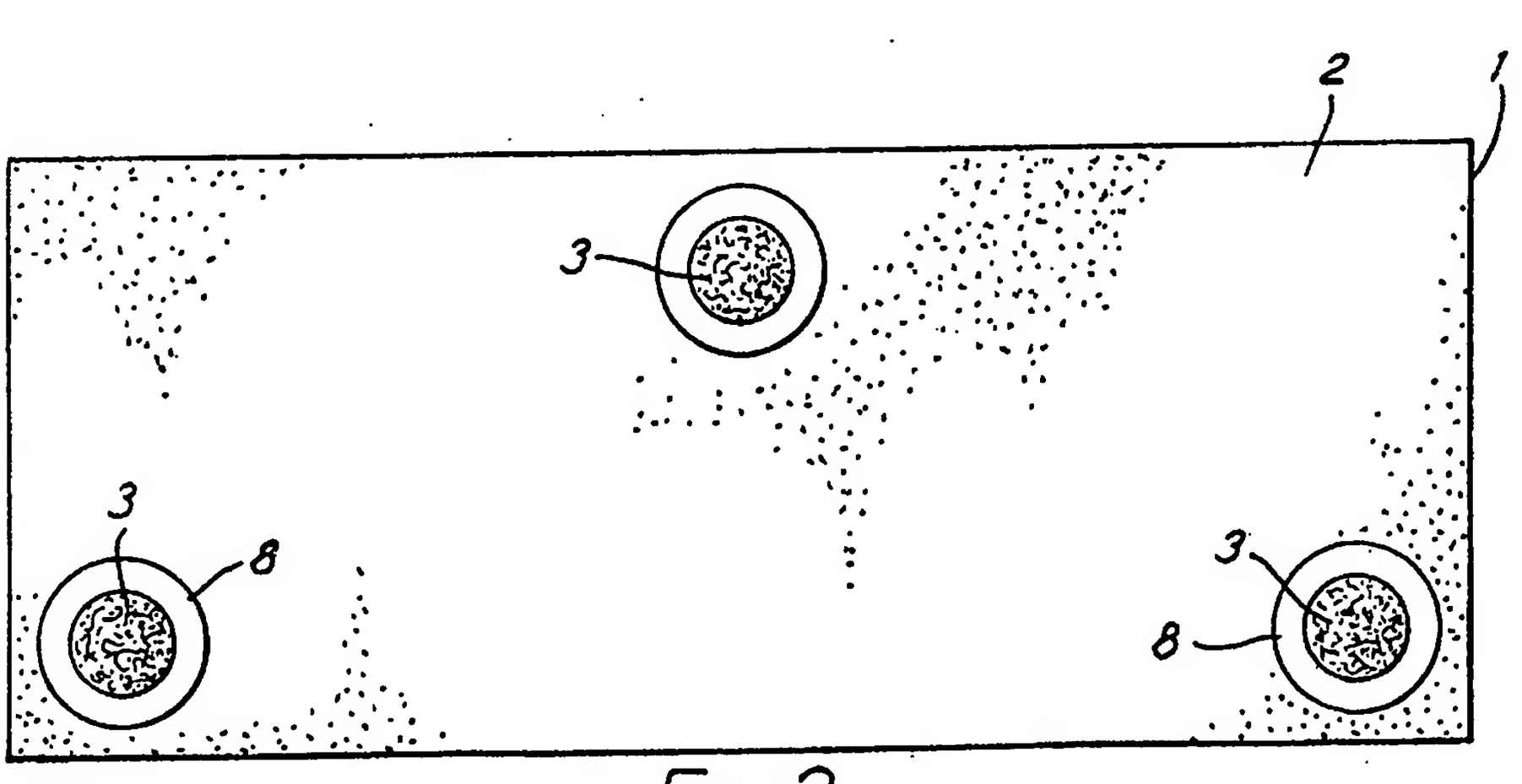

FIG.3

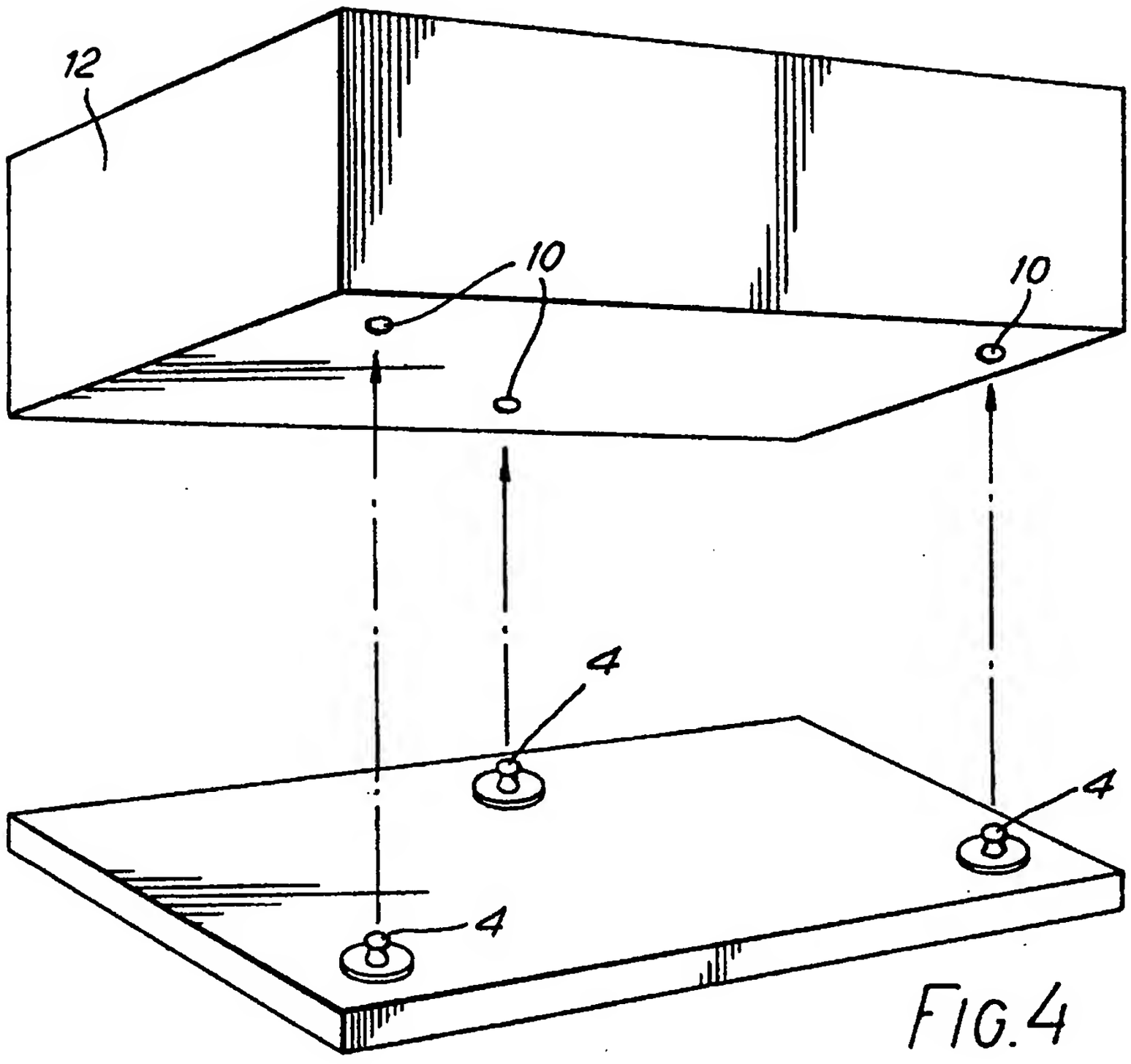

FIG.4

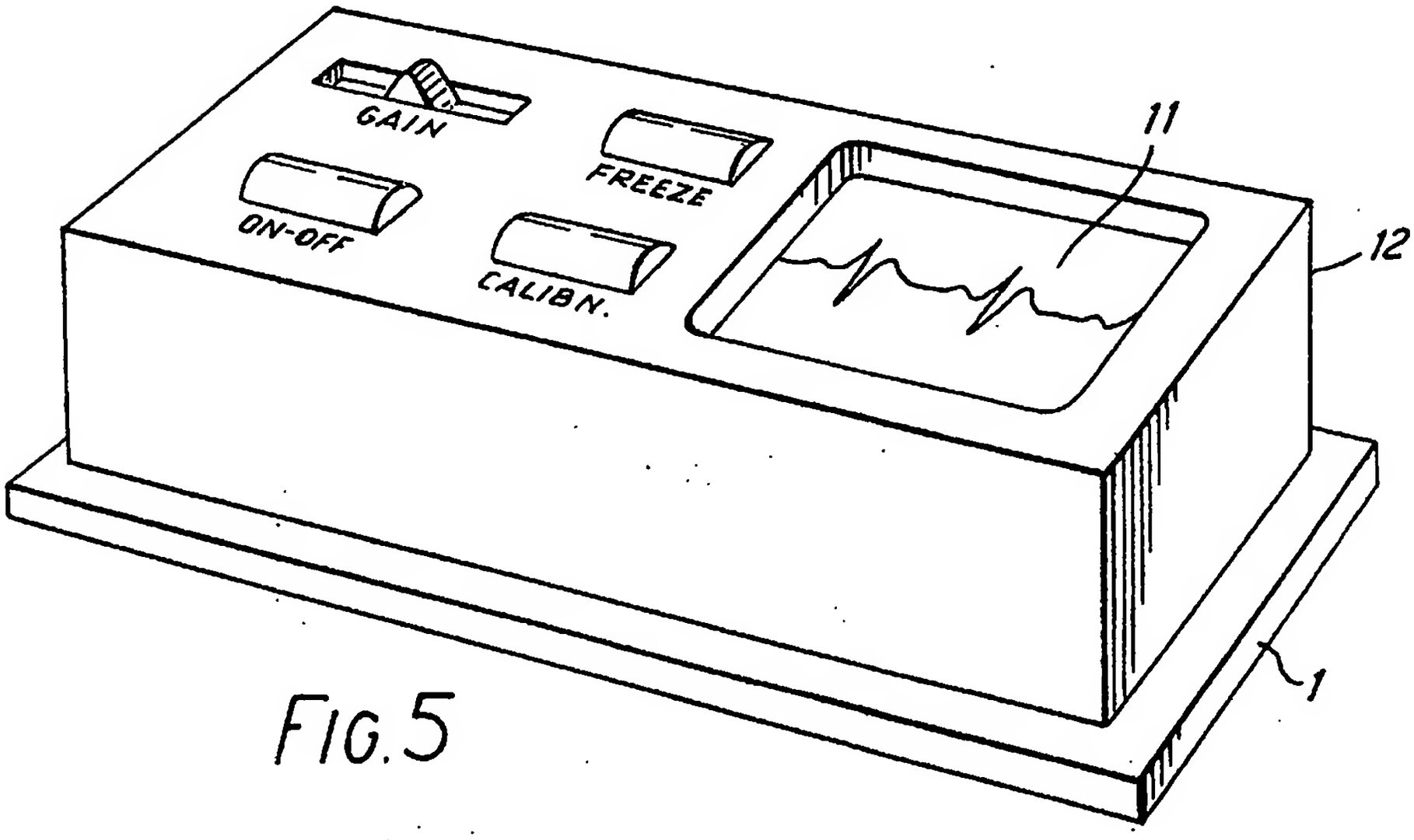

FIG.5

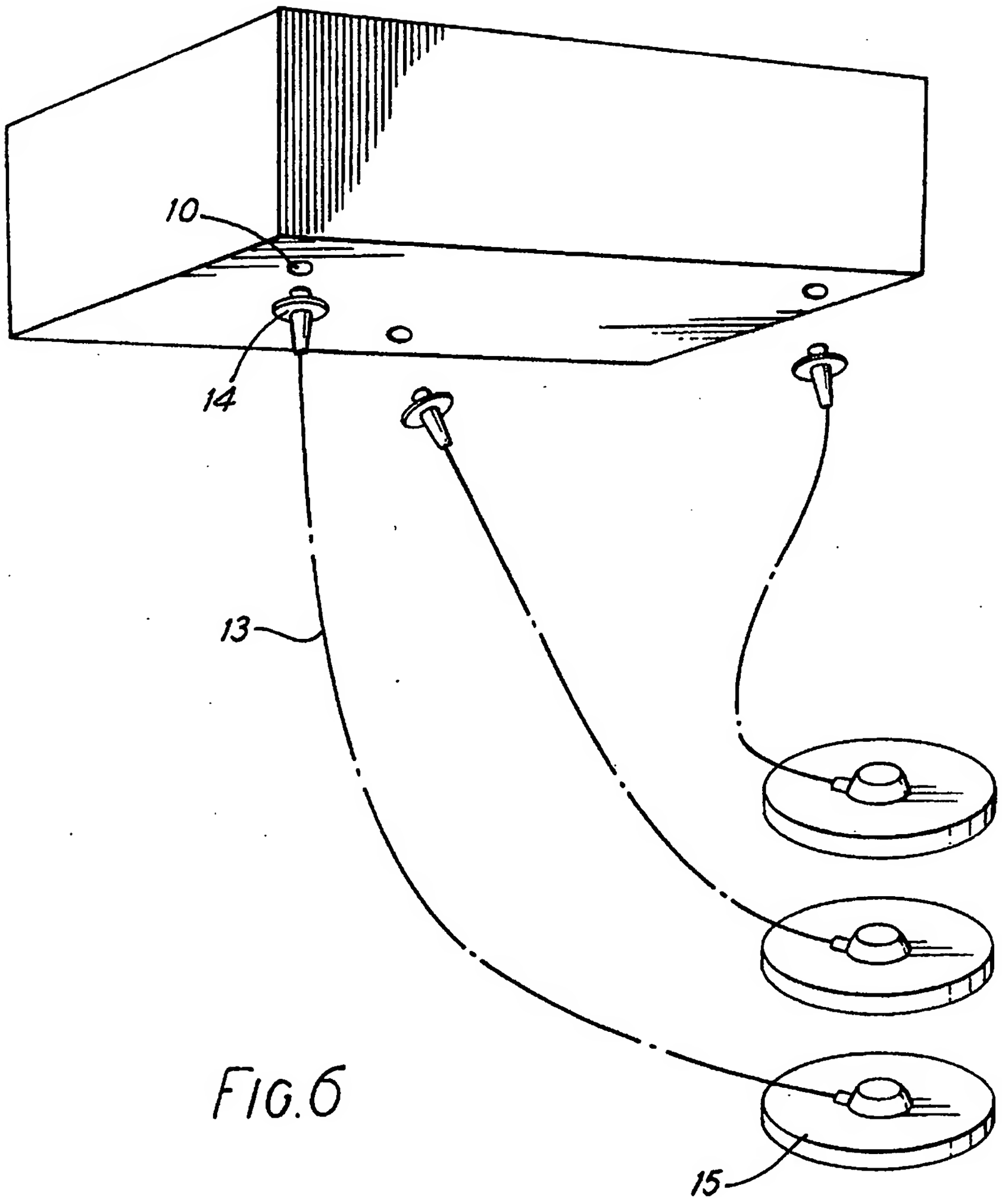

FIG.6

SPECIFICATION

Processing of physiological electric signals

This invention relates to connection of a patient to a unit for processing electrical signals from the patient. It is applicable especially but not exclusively to display of electric signals from the heart by means of an electrocardiograph.

In hospital intensive care units and elsewhere it is frequently desirable to connect patients to apparatus for continuously monitoring electric signals from the body, especially the heart. Existing methods of achieving this generally require electrodes attached to the patient to be connected by relatively long cables to apparatus for processing and displaying the signals received. Such an arrangement can be inconvenient for the patient and medical staff in attendance.

It is possible to provide an electrocardiograph (ECG) unit which is portable and self-contained and has built-in electrodes whereby the whole unit is held manually against a patient's chest and the signals obtained are displayed on a screen. However this method of observing an ECG trace is not continuous and has the disadvantage that a hand-held instrument will tend to generate artifact unless it is held very firmly in a totally stationary position.

The present invention is intended to provide a means for attaching to a patient's body a unit for processing physiological electric signals which allows use of a self-contained unit which is readily carried by the patient and can give a continuous display of the signals with a minimum of artifact.

According to one aspect of the invention, there is provided a pad capable of adhering to a patient's body, the pad carrying at least one electrode passing therethrough, the electrode having a portion on one side of the pad adapted to form an electric contact with the patient's body and a portion on the other side of the pad capable of engaging a unit for processing electric signals received from the patient through the electrode.

In a preferred embodiment a single pad carries all the electrodes (at least two) required for feeding the unit with signals from the body. The unit itself may be mounted in contact with the pad and the electrode portions on the outside of the pad relative to the patient may clamp or otherwise firmly support the unit on the pad.

In one preferred arrangement the electrodes are provided with male press-studs on the outside of the pad and these are positioned to correspond to female press-studs in the unit. When the pad has been applied to the patient, generally to the chest when the unit is an ECG unit, the unit may then be applied by pressing it on to the male press-studs which form electrical contact with the female studs in the unit. The unit is then firmly but removably attached to the pad by the electrodes themselves. The electrodes will normally be three in number, that is a pair of electrodes to form a circuit for the signals to be observed and a third electrode which forms an earth or neutral connection to the patient's body.

The pad of this arrangement may also be used in a different mode whereby the male press-studs are attached to female studs on the ends of extension cables which themselves are connected to the unit. The pad thus allows use of units which are either carried by the patient or remote from the patient.

The pad may be of a foam plastics material with the lower side, to come into contact with the patient, coated with a suitable adhesive so that the pad sticks firmly to the patient but can be removed after use. In order to establish good electric contact with the patient's skin the lower ends of the electrodes may carry foam contact pads which contain an electrically conducting paste. These pads may project outwardly from the lower side of the pad and become compressed when the pad is applied to the patient so that a reliable contact is established.

Methods of mounting an electrocardiograph (ECG) on a patient's body according to the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a view from above of an electrode pad,

Figure 2 is a section along A—A of Figure 1,

Figure 3 is a view from below of the pad of Figure 1,

Figure 4 shows a method of mounting an ECG on a patient using the pad of Figures 1—3,

Figure 5 shows an ECG mounted on the pad of Figure 1, and

Figure 6 shows another method of connecting an ECG to a patient.

Referring to Figures 1—3, a rectangular pad 1 of electrically insulating foam material is provided on its lower surface 2 with a layer of an adhesive suitable for adhering the pad, firmly but removably, to a patient's body.

The pad is also provided with 3 electrodes 3. Each electrode comprises a metal stem having a male press-stud head 4 projecting above the upper surface of the pad and a pair of flanges 5 and 6. Flange 5 engages the upper surface of the pad. Flange 6 engages the lower surface of the pad in a socket 7 which is lined with a cup of rigid plastics material 8. Flanges 5 and 6 thus hold the electrode in the desired position in the pad.

The lower surface of flange 6 is firmly adhered to a piece of foam material 9 which is saturated with an electrically conducting paste. The foam material 9 projects below the lower surface of the pad 1 by a short distance and is thus compressed when the pad 1 is adhered to a patient's body. A reliable electrical contact is thus established between the patient's body and the press-stud 4.

The electrodes 3 are positioned on the pad in such a way that they correspond to three female press-stud sockets 10 on a portable ECG unit (see Figure 4). This unit contains circuitry whereby two of the female studs can supply signals received from studs 4 to give an ECG trace, the third stud providing an earth or neutral connection to the patient. When the ECG unit is applied to the pad

with the three male studs engaging the corresponding female studs, as shown in Figure 5, the ECG unit can show an ECG trace derived from the patient on the display screen 11.

When mounted as shown in Figure 5 the ECG unit is firmly attached to the patient by the press-studs and the adhesion of the pad 1 to the patient's body and a satisfactory electric contact between the body and the unit is maintained. The unit may use a miniature cathode ray tube to provide the display screen 11 and this, together with associated circuitry and controls and a small battery to make the unit self-contained, may occupy a rectangular casing 12 as small as 15 cm×5 cm×3.7 cm. The pad is then small enough to be applied sufficiently flat to the chest of a patient with the electrodes in suitable positions to receive ECG signals and the unit is sufficiently light not to be troublesome for the patient. With the unit in operation the behaviour of the patient's heart can be observed at a glance from the display screen.

If it is desired to position the ECG unit at a distance from the patient, instead of being inserted directly in the female studs 10 the male studs 4 may be connected to a respective female stud at the end of a cable, the other end of the cable being provided with a male stud to engage a female stud 10 in the unit.

An alternative method of connecting an ECG unit to a patient is shown in Figure 6. In this case cables 13 are provided at one end with a male press-stud 14 to engage female studs 10 but the other ends of the cables are provided with individual electrode assemblies 15. These assemblies may comprise pads of the same construction as shown in Figures 1—3 but each containing only one electrode.

It will be understood that this invention is applicable to electrocardiographs but may also be used with other types of apparatus.

CLAIMS

1. A pad capable of adhering to a patient's body, the pad carrying at least one electrode passing therethrough, the electrode having a portion on one side of the pad adapted to form an electric contact with the patient's body and a portion on the other side of the pad capable of engaging a unit for processing electric signals received from the patient through the electrode.

2. A pad according to Claim 1, in which the pad carries at least two electrodes.

3. A pad according to Claim 1 or 2, in which the electrode portion on said other side of the pad bears a male press-stud to engage a female press-stud attached to said unit.

4. A pad according to any preceding claim, in which the electrode portion on said one side of the pad comprises a piece of porous material impregnated with an electrically conducting fluid to establish electrical contact with the patient.

5. A pad according to Claim 4, in which the piece of porous material is attached to a flange of the electrode positioned in a socket in the pad which is lined with a rigid material.

6. A pad according to any preceding claim, comprising electrically insulating foam material having a layer of adhesive material for adhering the pad to a patient.

7. A pad, substantially as hereinbefore described with reference to the accompanying drawings.

8. Diagnostic apparatus, comprising a unit for processing electric signals from a patient connected to a pad according to any preceding claim.

9. Apparatus according to Claim 8, in which the unit may be supported on the patient entirely by the pad.

10. Apparatus according to Claim 9, in which the pad has more than one electrode bearing a male press-stud and the unit has female press-studs adapted to engage the male press-studs of the pad to hold the unit on the pad and establish electrical connections between the electrodes and the unit.

11. Apparatus according to Claim 8, 9 or 10 in which the unit is an electrocardiograph.

12. Apparatus according to any one of Claims 8 to 11, in which the pad carries three electrodes of which one is a neutral electrode.

13. Diagnostic apparatus, substantially as hereinbefore described with reference to the accompanying drawings.

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